



PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

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|---|--|--|-----------------------|
| Applicant's or agent's file reference OP100808SKI | FOR FURTHER ACTION | | See Form PCT/IPEA/416 |
| International application No. PCT/FI2004/000501 | International filing date (day/month/year) 27.08.2004 | Priority date (day/month/year) 29.08.2003 | |
| International Patent Classification (IPC) or national classification and IPC G05B13/02, C02F1/00, G05D21/02 | | | |
| Applicant KEMIRA OYJ ET AL. | | | |
| <p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input type="checkbox"/> sent to the applicant and to the International Bureau) a total of sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> | | | |
| <p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p> | | | |
| Date of submission of the demand 28.06.2005 | | Date of completion of this report 15.12.2005 | |
| Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016 | | Authorized Officer Goetz, P Telephone No. +31 70 340-2556  | |

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International application No.
PCT/FI2004/000501

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-28 as originally filed

Claims, Numbers

1-35 as originally filed

Drawings, Sheets

1/15-15/15 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|------|
| Novelty (N) | Yes: Claims | 1-35 |
| | No: Claims | |
| Inventive step (IS) | Yes: Claims | |
| | No: Claims | 1-35 |
| Industrial applicability (IA) | Yes: Claims | 1-35 |
| | No: Claims | |

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. Reference is made to the following documents:

D1: E JUUSO ET AL.: "Intelligent methods in dosing control of water treatment" PROCEEDINGS OF WORKSHOP ON APPLICATIONS IN CHEMICAL AND BIOCHEMICAL INDUSTRY, 15 September 1999 (1999-09-15), XP002311026

D2: JÄRVENSIVU ET AL.: "Intelligent control of a rotary kiln fired with producer gas generated from biomass" ENGINEERING APPLICATIONS OF ARTIFICIAL INTELLIGENCE, vol. 14, no. 5, October 2001 (2001-10), pages 629-653, XP002311027

2. The document D1 is regarded as being the closest prior art to the subject-matter of claim 1 and discloses a method for automatic dose control of one or more chemicals in a liquid treatment system whereby an adaptive linguistic equation controller (see p.4, l.8 "the model can be used as a feedforward controller") is used to control the dosing of one or more chemicals to the liquid (see introduction).
The subject-matter of claim 1 therefore differs from this known method in that the properties of the liquid are used to modify the control surface of the linguistic equation controller by means of a predefined adaptation model.
3. The problem to be solved by the present invention may therefore be regarded as how to improve a linguistic equation controller in a way which allows to it to be used for completely controlling (thus also with feedback control) a process.
4. The solution proposed in claim 1 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) for the following reasons.
5. The skilled person implementing the method disclosed in document D1 would notice that the adaptation procedure in document D1 is incomplete and that only the steady-state model based on linguistic equations could be used as **(feedforward) controller** (see

conclusion). In document D1 it is explicitly stated that the dynamic model needs improvement before using it in the controller design. This would be a hint for the skilled person to look for a more developed adaptation method. Since such a method should be compatible with LE-control he would look in the documentation concerning the application of LE-controllers in the field of process control and would find document D2 disclosing a LE based control method for a process requiring both feedforward and feedback control.

6. Document D2 would teach him that:
 - "Adaptation to changing operation conditions is necessary" (paragr. 4.2.4. 1st lines). The skilled person would therewith see a hint that by an appropriate adaption of the coefficients of a LE-controller, such a controller becomes suitable for both modelling and controlling a process. In addition it is indicated that, as for document D1 the LE approach was originally used for modelling but that it has been expanded for control purposes (paragr. 4.2).
 - The adaptation is carried out by modifying the control surface of a LE-controller (see p. 636, right-hand column, 3rd paragraph : "The operation of the LE controller is modified by means of adaptive scaling, which is used to adjust the control surface in accordance with changing operating conditions"). The determination of the scaling rate coefficient (i.e. the adaptation of the controller coefficients) is made on the basis of the working point, taking into account, in particular the loading state of the process.
7. Such an adaptation could be incorporated into the system for automatic dosing of chemicals (based on the same technology) and would, by improving the performance of the dynamic model, allow the use of it in the controller design. Since it is explicitly stated in document D1 that improvement in this direction is sought, the skilled person would consider as a normal option to use such kind of adaptation in the system of document D1. When trying to incorporate this adaptation method in the system of document D1 he would have to select the variables defining the working point (WP). It is evident that the variables available in the system of document D1 which define the WP would be the turbidity and the flow rate, which can be considered as properties of the liquid. The skilled person would therefore consider as a normal design option to use these properties of the liquid for modifying adaptively the control surface of the linguistic equation controller and to arrive therewith to the control method of claim 1.

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9. The fact that the process in document D2 is relatively slow is not relevant in the present case because the skilled person is aware of the modifications which have to be implemented when a control system has to be implemented in a process with different characteristics (The system of document D2 has been tested in a solar-power plant having characteristics differing from those of a rotary kiln).
10. It is therefore considered that the subject-matter of claim 1 does not involve an inventive step.
11. Documents D1 and D2 disclose also the devices used for implementing the disclosed method. The subject-matter of independent claim 18 containing only features corresponding to features of claim 1 would therefore not involve an inventive step when considering the combination of document D1 and D2.
12. The additional features of dependent claims 2 to 17 and 19 to 35 seem not to involve an inventive step because they concern only steps which are either known from the cited prior art or generally known in the field of automatic control or in the field of water treatment.
8. The claimed method and device of the present application refer to the dosing of chemicals in a liquid treatment system. The industrial applicability of the claimed invention is therefore given.